

**Title 10 – Department of Natural Resources**  
**Division 23 – [Geological Survey and Resource Assessment Division]**  
**Division of Environmental Quality**  
**Chapter 5 – Heat Pump Construction Code**

**RULE AMENDMENT**

**10 CSR 23-5.050 Construction Standards for Closed-Loop Heat Pump Wells**

*PURPOSE: This amendment requires more stringent well drilling standards to be utilized in areas where groundwater is contaminated with contaminants of concern or degradation products in the Weldon Spring, St. Charles County, vicinity. Contaminants of concern at the U.S. Army Corps of Engineers (COE) site include: trinitrotoluene (TNT) and dinitrotoluene (DNT). Department of Energy (DOE) contaminants of concern at the Main Site include 2, 4, 6-TNT, 2, 4-DNT, 2, 6-DNT, dinitrobenzene (1, 3-DNB), nitrobenzene (NB), nitrate, uranium, and trichloroethylene (TCE). Only uranium and 2, 4-DNT are contaminants of concern at the DOE Quarry. It also changes the name of the Division.*

*PURPOSE: This rule describes the minimum standards for a properly constructed closed-loop heat pump well.*

(6) Hole Depth. Closed-loop heat pump wells must not be deeper than two hundred feet (200'). A variance must be obtained in advance, from the division, to drill a heat pump well deeper than two hundred feet (200'). A heat pump well drilled in Area C (see 10 CSR 23-3.100 (3)) that is less than two hundred feet (200') deep and cuts the Northview Formation must have a thirty-foot (30') grout plug set starting at ten feet (10') below the bottom of the Northview Formation. A map will be provided by the division showing the depth the grout plug must start. Follow the grouting requirement set out in 10 CSR 23-5.050 (8) for grouting the interval above the Northview Formation. [A heat pump well drilled in Special Area 3 shall not be deeper than one hundred fifty feet (150')]. **Total depth of a new heat pump well in Special Area 3 and Special Area 4 shall be determined in advance of drilling by the division.** At any heat pump well being drilled, per division guidance, in which PCE and/or TCE is encountered in a pure-product phase (also known as Dense Non-Aqueous Phase Liquid or DNAPL), drilling shall cease and the division shall be notified immediately. The division will determine further action.

(8) Grouting Depth of Vertical Heat Pump Wells. Grouting the annulus of a heat pump well is very important and must be completed immediately after the well is drilled due to cave-in potential in the uncased hole. Full-length grout is recommended and may be required (see section (5)) to prevent surface contamination from entering the drinking water aquifer through the borehole. The grout required for heat pump wells greater than two hundred feet (200') in depth must be determined by the division in advance. A variance form will be issued setting the grouting requirements. If the heat pump borehole is not grouted full-length, hole size requirements stated in section (5) must be followed and nonslurry bentonite plugs must be placed into the borehole. A plug (first plug) must

be placed about forty feet (40') above the total depth of the borehole. This plug must be composed of bentonite chips or pellets utilizing at least one (1) bag forty feet (40') above the total depth of the borehole. This plug must be composed of bentonite chips or pellets utilizing at least one (1) bag of bentonite resulting in at least a five foot (5') plug. Every forty feet (40') of borehole that exists above the first plug must have a plug set as described in this section. A near surface plug consisting of bentonite granules or powder must be set from a point ten feet (10') below the bottom of the trench, that connects the closed-loop to the heat pump machine, to the base of the trench. All bentonite plugs must be hydrated immediately after emplacement if they are in the unsaturated zone. All clean fill material placed between the bentonite plugs must be chlorinated. Heat pump wells in **Special Area 3 and Special Area 4** must be grouted full length with thermal grout, placed from the bottom of the borehole up to the base of the trench.

#### (12) Heat Pump Wells in Special Area 3.

Portions of Franklin County within and south of the city of New Haven are listed as Special Area 3 (Figures 7B and 7C, 10 CSR 23-3.100(7)) due to the contamination of portions of the aquifer by one (1) or more of the following chemicals of concern: tetrachloroethylene (PCE), trichloroethylene (TCE), PCE degradation products and TCE degradation products or other contaminants of the National Public Drinking Water Regulations (NPDWR). In this area it is necessary to utilize more stringent construction standards for new heat pump wells that are drilled into the aquifer. In Special Area 3 a qualified and properly trained individual shall collect all groundwater samples for analysis of chemicals of concern.

(A) The division shall be consulted before constructing a new heat pump well in Special Area 3. The division will provide specific guidance on heat pump well drilling protocol and construction specifications on a case-by-case basis. The division must provide written approval for all new heat pump wells prior to construction.

(B) All drilling-derived fluids and solid materials shall be containerized and sampled before disposal in an appropriate location based on analytical results.

(C) At any heat pump well being drilled, per division guidance, in which PCE and/or TCE is encountered in a pure-product phase (also known as Dense Non-Aqueous Phase Liquid or DNAPL), drilling shall cease and the division shall be notified immediately. The division will determine further action.

#### (13) Heat Pump Wells in Special Area 4.

Portions of St. Charles County west of the city of Weldon Spring are listed as **Special Area 4** (Figures 7D, 10 CSR 23-3.100(8)) due to the contamination of portions of the aquifer by one (1) or more of the following chemicals of concern: **trinitrotoluene (TNT) and dinitrotoluene (DNT) at the Army Corps of Engineers (COE) site, 2,4,6-TNT, 2,4,-DNT, 2,6-DNT, dinitrobenzene (1,3-DB), nitrobenzene (NB), nitrate, uranium, and trichloroethylene (TCE) at the Department of Energy**

**(DOE) Main Site, uranium and 2,4-DNT at the DOE Quarry, or other contaminants of the National Public Drinking Water Regulations (NPDWR). In this area it is necessary to utilize more stringent construction standards for new heat pump wells that are drilled into or through the shallow aquifer defined as the Burlington Keokuk/Fern Glen formation(s) at the main site and the Kimmswick limestone at the DOE Quarry. In Special Area 4 a qualified and properly trained individual shall collect all groundwater samples for analysis of chemicals of concern. Sampling qualifications and training requirements will be determined in advance of sampling by the division and approval will be issued in written format.**

**(A) The division shall be consulted before constructing a new heat pump well in Special Area 4. The division will provide specific guidance on heat pump well drilling protocol and construction specifications on a case-by-case basis. The division must provide written approval for all new heat pump wells prior to construction.**

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